Lesson 10. Respiration in Organisms.

Grade VII

RESPIRATION

External Respiration

- Process in which oxygen is taken inside the body and carbon dioxide is given out.
- It is also called breathing.

Internal Respiration

- Process in which food is broken down in body cells through various chemical reactions.

Respiration in plants

- Leaves have pores called **stomata** for gaseous exchange by diffusion
- Stems have openings called lenticels for gaseous exchange by diffusion.
- Roots have stomatal pores for gaseous exchange of oxygen dissolved in soil water.

Respiration in Animals

Respiration in Humans

- Inhaled air passes through nostrils into nasal cavity and then into lungs through windpipe.
- During inhalation ribs move up and outwards. And diaphragm moves down.
- In the lungs, the windpipe branches out into bronchi and even smaller bronchioles, which end in air sacs called alveoli.
- Here, oxygen from the air diffuses into blood capillaries and carbon dioxide diffuses our into the alveoli.
- During exhalation, ribs move down and inwards, and diaphragm moves up.

Earthworm

- Gaseous exchange occurs through its skin.
- Thin, moist skin is supplied with a network of capillaries
- These absorb oxygen from the atmosphere and get rid of carbon dioxide from the body.

Insects

- Gaseous exchange takes place through the entire body surface by diffusion.
- They have elaborate system of branching tubes called tracheae.

Fish

- Fish absorbs dissolved oxygen from the water by means of gills.
- Water flows across the gills, the oxygen in it gets diffused into the blood circulating in gills.
- Carbon dioxide in the bloodstream diffuses into the water and is carried out through a gap between the fish's body and the gills

Frogs

- Exchange of gases in frog takes place through its thin, moist and smooth skin, when in water.
- Frogs also have lungs for respiration on land .

Aerobic respiration

Food molecules are combined with oxygen and get oxidised inside cell into carbon dioxide and water along with energy.

Glucose + Oxygen $\xrightarrow{\text{Enzymes}}$ Carbon dioxide + Water + Energy

Aerobic respiration

Food molecules are broken down without using oxygen along with release of energy.

Glucose + $\xrightarrow{\text{Yeast}}$ Ethyl Alcohol + Carbon dioxide + Energy

Glucose $\longrightarrow$ Lactic acid + Energy
(in muscles)

Know the Terms

- **Aerobic respiration :**When breakdown of glucose occurs with the use of oxygen, it is called aerobic respiration.
- **Anaerobic respiration:**Food can also be broken down, without using oxygen. This is called anaerobic respiration.
- **Diaphragm** **:**A large, muscular sheet called diaphragm forms the floor of chest cavity.
- **Gills** **:**Gills in fish help them to use oxygen dissolved in water.
- **Exhalation** **:**giving out of air rich in carbon dioxide is known as exhalation.
- **Inhalation** **:**Taking in of air rich in oxygen into the body is called inhalation.
- **Tracheae** **:** Insects have a network of air tubes called tracheae for exchange.

Objective Type Questions

(1 Mark each)

I. Multiple choice questions

1. In cockroaches, air enters the body through

a. lungs b. gills c. spiracles d. skin

2. Normal range of breathing rate per minute in a normal adult at rest is

a. 9 – 12 b. 21 – 25 c. 15 – 18 d. 24 – 30

3. During exhalation, the ribs.

a. moving outwards b. move downwards c. move upwards d. do not move at all

4. The end product of respiration are

a. CO_2 and energy b. CO_2 and water c. CO_2 and Oxygen d. CO_2water and energy

5. Which of the following organism can respire anaerobically?

a. Amoeba b. Yeast c. Paramecium d. Euglena

6. Sometimes when we do heavy exercise, anaerobic respiration takes place in our muscle cells. What is produced during this process? **[NCERT Exemplar]**

a. alcohol and latic acid b. alcohol and CO_2

c. lactic acid and CO_2 d. Lactic acid only

7. Yeast is used in wine an beer industries because it respires. [NCERT Exemplar]

a. aerobically producing oxygen b. aerobically producing alcohol

c. anaerobically producing alcohol d. anaerobically producing CO_2

8. During the process of exhalation, the ribs move. **[NCERT Exemplar]**

a. down and inwards b. up and inwards

c. dow an outwards d. up and outward

9. Breathing is a process that. **[NCERT Exemplar]**

a. provides O_2 to the body b. breaks down food to release energy

c. helps the body to get rid of CO_2 d. Produces water in the cells

Which of the following gives the correct combination of functions of breathing?

a. i and ii b. ii and iii c. i and iii d. ii and iv

10. Fish breathe with the help of gills which are richly supplied with blood vessels. The gills help the fish to. **[NCERT Exemplar]**

a. take in oxygen from air b. take in oxygen dissolved in water

c. absorb nutrients present in water d. release waste substances in water

11. Earthworms and frogs breathe through their skin because of which the skin of both the organisms is. **[NCERT Exemplar]**

a. moist and rough b. dry and rough c. dry and slimy d. moist and slimy

1. c	2. c	3. b	4. d	5. b	6. d	7. c	8. a	9. c	10. b	11. d

II. Multiple choice questions

1. The respiratory gases are

a. O_2 and SO_2 b. O_2 and NO_2 c. O_2 and CO_2 d. O_2 and O_3

2. The main respiratory organ in human is

a. Lungs b. Heart c. Liver d. Stomach

3. The cellular aerobic respiration takes place in

a. Nucleus b. Cytoplasm c. Mitochondria d. Chloroplast

4. The raw material for the cellular respiration is

a. Starch b. Glucose c. Sugar d. All of these

5. The end products of aerobic respiration are.

a. CO_2 water and energy b. Lactic acid

c. Alcohol, CO_2 and energy d. None of these

1. c	2. a	3. c	4. b	5. a

I. Fill in the blanks

1. The air tubes of insect open to exterior by _____.
2. Wind pipe in humans is called _____.
3. Yeast can survive in absence of oxygen and is known as _____.
4. Frog can breathe through skin as well as _____.
5. The breathing is a _____ process while cellular respiration is a _____ process.
6. Main source of energy for living beings is _____.
7. The accumulation of _____ causes muscle cramps.
8. The main products of aerobic respiration are _____ and _____.
9. The roots of a plant take up oxygen from the trapped between the _____ particles. **[NCERT Exemplar]**
10. Diaphragm forms the _____ of the chest cavity.
11. Exchange of gases in the leaves take place with the help of _____. **[NCERT Exemplar]**
12. Cockroaches breathe with the help of air tubes called _____. **[NCERT Exemplar]**

1. spiracle	2. trachea	3. anaerobic respiration
4. lungs	5. physical, chemical	6. food
7. lactic acid	8. Carbon dioxide, water	9. air, soil
10. floor	11. stomata	12. tracheae

II. Fill in the blanks

1. The breathing is a _____ process while cellular respiration is a _____ process.
2. Main source of energy for living beings is _____.
3. The taking in of air rich in oxygen into body is called _____.
4. The accumulation of _____causes muscle cramps.
5. The main products of aerobic respiration are _____and _____.

1. physical, chemical	2. food	3. inhalation
4. lactic acid	5. carbon dioxide, water	

I. Match the following

Column A	Column B
i. Fish	a. Skin and lungs
ii. Insects	b. Earthworm
iii. Frogs	c. Stomata
iv. Skin	d. Gills
v. Plants	e. Spiracles

i. d	ii. e	iii. a	iv. b	v. c

II. Match the following

I. Column I	Column II
a.	i.
b.	ii.
c.	iii. Trachea
d. Diaphragm	iv. Anaerobic
e. Yeast	v. Muscle cramps
f. Lactic acid	vi. Floor of chest cavity
g. Wind pipe	vii.
h.	viii.

a.	b.	c.	d. vi	e. iv	f. v	g. iii	h.

II. Column A	Column B
a. Butterfly	i. Lungs
b. Earthworms	ii. Spiracles
c. Sparrow	iii. Skin

a. ii	b. iii	c. i

I. True or False

1. Oxygen breaks down glucose outside the cells of organisms.
2. Frogs can breathe through their skin as well lungs.
3. Insects have spiracles on the lower surface of the body.
4. Exhaled air has more percentage of CO_2 than inhaled air.

1. False	2. True	3. False	4. True

II. True or False

1. Food is the main source of energy for all the living organisms.
2. Plants do not respire like other living organisms.
3. During heavy exercise the breathing rate is decreased.
4. Cellular respiration takes place in the cells of all organisms.
5. Muscles cannot respire anaerobically.

1. True	2. False	3. False	4. True	5. True

Quiz Time

1. Name the process of inhalation and exhalation of air.

2. Write two types of respiration processes.

3. Write the word equation of aerobic respiration.

4. What is yeast?

5. Name the muscular wall which separates chest cavity from abdomen cavity.

6. Name the respiratory organ in fish.

7. Cockroaches have a special network of tubes for respiration. Name it.

8. Write the name of functional and the structural unit of all organisms.

9. Write the products of aerobic respiration.

10. What are the two major steps of breathing?

1. Breathing

2. i. Aerobic respiration ii. Anaerobic respiration

3. Glucose + Oxygen → Carbon dioxide + Water + Energy

4. Yeast is a unicellular organisms that performs anaerobic respiration

5. Diaphragm

6. Gills

7. Tracheae

8. Cell

9. Water, Carbon dioxide and Energy

10. i. Inhalation ii. Exhalation

NCERT Corner

Intext Questions

1. But, where does this energy come from?

The energy is derived from food.

2. Can you say why your parents insist that you should eat regularly?

Food gives us energy and builds our body. If we do not eat regularly, we will suffer bodily.

3. We get relief from cramps after a hot water bath or a massage. Can you guess why it is so?

Hot water bath or massage improves circulation of blood. Consequently the supply of oxygen to the muscle cells increases. The increase in the supply of oxygen leads to the complete breakdown of lactic acid into carbon dioxide and water so we get relief.

4. What did you fell after some time?

I felt suffocated.

5. How long were you able to keep both of them closed.

For 50 seconds.

6. Find out how many times you breathe in and breathe out in a minute.

15-18 times.

7. Did you inhale the same number of times as you exhaled ?

Yes.

8. Complete the table.

Table 10.1 Changes in breathing rate under different conditions

Name of the classmate	Breathing rate			
	Normal	After a brisk walk for 10 minutes	After running fast 100 m	At rest
Akash	14	17	22	14
Jairul	15	18	25	15
Antony	14	18	23	14
Gurprit	16	20	25	16
Self	15	18	23	15

9. Does this explain physical activity ?

Yes, because after energy.

10. When you feel drowsy, does your breathing rate slow down ?

Yes. When we feel drowsy our breathing rate becomes slow.

11. Does your body receive sufficient oxygen ?

No. Our body does not get enough oxygen in such cases.

12. How does breathing rate vary during heavy exercise ?

During heavy exercise, the breathing rate can rise upto 25 times per minute.

13. Can you say in which activity the rate of breathing will be the slowest and in which it will be the fasted ?

Breathing rate is the lowest during sleep and highest while jumping.

14. Assign numbers to the pictures in the order of increasing rate of breathing according to your experience.

15. What do you find ?

The abdomen moves up and down.

16. Complete the table. Table 10.2 : Effect of breathing on the chest size of some classmates.

Name of the classmate	Size of chest (cm)		
	During in halation	During exhalation	Difference in size
Akash	65	61	4
Jairul	71	68	3
Gurprit	75	70	5
Self	73	69	4

17. Did you see any changes in the balloons ?

Yes. When the rubber sheet is pulled down,the balloons expand. When the rubber sheet is pushed up, the balloons shrink.

18. What do you balloons in this model represent ?

Lungs

19. What does the rubber sheet represents ?

Diaphragm.

20. Is there a change in the appearance of lime water ?

This lime water becomes milky.

21. Can you explain this change on the basis of what you learnt in Chapter 6 ?

Lime water turns milky when carbon dioxide is passed through it. This confirms that exhaled air contains more carbon dioxide.

22. What do we exhale ?

We exhale air rich in carbon dioxide.

23. Do we exhale only carbon dioxide or a mixture of gases along with it ?

We exhale a mixture of gases together with carbon dioxide.

24. From where do these droplets come ?

These droplets come from the water vapour with exhaled air.

25. Boojho wants to know how much air a person can hold in the lungs.

500 ml.

26. Boojho has seen in television programmes that whales and dolphins often come up to the water surface. They even release a fountain of water sometimes while moving upwards. Why do they do so ?

Whales and dolphins breathe in air during inhalation. They exhale out the air on the surface. The water vapour condenses and we find the condensed water vapour like the fountain.

27. Can we survive in water ?

No.

28. How do they breathe under water ?

Gills in the fish enable them to use oxygen dissolved in water. Gills are projections of the skin. Gills are well supplied with blood vessels for exchange of gases.

29. Paheli wants to know whether roots which are underground also take in oxygen ? If so, how?

Yes. Roots take up air from the spaces found between the soil particles.

30. Can you guess what would happen if a potted plant is over watered ?

The roots will get no air to respire. The roots will not last and hence the whole plant will also die.

Textbook Questions

1. Why does an athlete breathe faster and deeper than usual after finishing the race ?

During running, the athlete spends lot of energy. So, he/she breathes faster to make up the loss in energy.

2. List the similarities and differences between aerobic and anaerobic respiration.

Similarities :

(i) Energy gets discharged.

(ii) Carbon dioxide is produced.

Differences :

(i) Anaerobic respiration needs no oxygen while aerobic respiration occurs in the presence of oxygen.

(ii) Glucose is completely broken down in aerobic respiration but not in anaerobic respiration.

3. Why do we often sneeze when we inhale a lot of dust-laden air ?

The air around us carries various types of unwanted particles, such as smoke, dust, pollens etc. When we inhale the particles get caught in the hair present in our nasal cavity. However, sometimes these particles can get past the hair in the nasal cavity. Then they irritate the lining of the cavity, hence we start sneezing. That drives out the foreign particles from the inhaled air and a dust-free, clean air enters our body.

4. Take three test-tubes. Fill 3/4th of each with water. Label them A, B and C. Keep a snail in the test tube A, a water plant in test-tube B and in C, keep snail and plant both. Which test-tube would have the highest concentration of CO_2 ?

Test-tube C.

5. Tick the correct answer :

(a) In cockroaches, air enters the body through :

(i) lungs (ii) gills (iii) spiracles (iv) skin.

(b) During heavy exercise, we get cramps in the legs due to the accumulation of :

(i) carbon dioxide (ii) lactic acid (iii) alcohol (iv) water.

(c) Normal range of breathing rate per minute in an average adult person at rest is :

(i) 9-12 (ii) 15-18 (iii) 21-24 (iv) 30-33.

(d) During exhalation, the ribs :

(i) move outwards

(ii) move downwards

(iii) move upwards

(iv) do not move at all.

(a)-(iii), (b)-(ii), (c)-(ii), (d)-(ii).

6. Match the items in Column I with those in Column II :

Column I	**Column II**
(a) Yeast	(i) Earthworm
(b) Diaphragm	(ii) Gills
(c) Skin	(iii) Alcohol
(d) Leaves	(iv) Chest cavity
(e) Fish	(v) Stomata
(f) Frog	(vi) Lungs and skin
	(vii) Tracheae.

(a)-(iii),	(b)-(iv),	(c)-(i),	(d)-(v),	(e)-(ii),	(f)-(vi).

7. Mark 'T' if the statement is true and 'F' if it is false :

i. During heavy exercise the breathing rate of a person slows down.

(ii) Plants carry out photosynthesis only during the day and respiration only at night.

(iii) Frogs breathe through their skins as well as their lungs.

(iv) The fishes have lungs for respiration.

(v) The size of the chest cavity increases during inhalation.

(i) F	(ii) F	(iii) T	(iv) F	(v) T

8. Given below is a square of letters in which are hidden different words related to respiration in organisms. These words may be present in any direction upwards, downwards or along the diagonal structures surrounding chest cavity

(iii) Muscular floor of chest cavity

(iv) Tiny pores on the surface of leaf

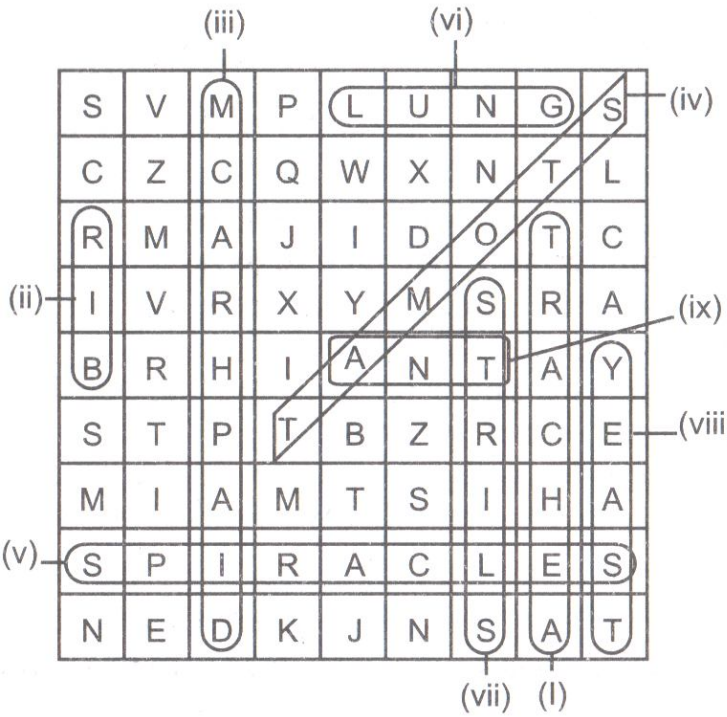
(v) Small openings on the sides of the body of an insect

(vi) The respiratory organs of human beings

(vii) The openings through which we inhale

(viii) An anaerobic organism

(ix) An organism with tracheal system



9. The mountaineers carry oxygen with them because.

a. At an altitude of more than 5 km there is no air.

b. The amount of air available to a person is less than that available on the ground.

c. The temperature of air is higher than that on the ground.

d. The pressure of air is higher than that on the ground.

b. The amount of air available to a person is less than that available on the ground.

I. Very Short Answer Type Questions.

1. What is cell?

The smallest structural and functional unit of an organism is called cell.

2. What are the functions performed by the cell?

The cell performs various function like nutrition, transportation, excretion and reproduction.

3. How does a cell perform these functions?

The cell needs energy to perform these functions.

4. What is the source of this energy?

Food is the source of this energy.

5. How does this energy released from the food?

This energy is released during respiration.

6. Why do all living organisms respire?

All living organisms respire to get energy from the food.

7. What is cellular respiration?

The process of breakdown of food in the cell with the release of energy is called cellular respiration.

8. Where does cellular respiration takes place?

Cellular respiration takes place is the mitochondria of the cells of all organisms.

9. How many types of respiration are there?

There are two types of respiration.

i. Aerobic respiration ii. Anaerobic respiration

10. What are the end products of anaerobic respiration in yeast?

Ethyl alcohol, carbon dioxide and energy.

11. What is the chemical substance formed in the anaerobic respiration in muscles?

Lactic acid.

12. What is Breathing ?

The process in which oxygen rich air is taken and carbon dioxide rich air is released is called breathing.

13. What are the two major steps of breathing?

i. Inhalation ii. Exhalation

14. What do you mean by breathing rate?

The number of times a person breathes in a minute is termed as the breathing rate.

15. What is inhalation?

The taking in of air, rich in oxygen into the body is called inhalation.

16. What happens in exhalation?

In exhalation, air rich in carbon dioxide is given out.

17. What are the functions of hair and mucus inside the nose?

Hair and mucus inside the nose prevent dirt, dust and germs from entering the respiratory system.

18. Write the names of various organs found in our respiratory system.

Nostrils, nasal cavity, windpipe and lungs.

19. Which gas is released during exhalation?

Mainly carbon dioxide gas is released during exhalation.

20. Do we exhale only carbon dioxide or a mixture of gases along with it?

No, some amount of moisture (water vapour) is also exhaled.

21. What happens when breathed air is passed through lime water?

The lime water becomes milky because carbon dioxide changes lime water into milky limestone.

22. What is the main role of blood in respiration?

The blood helps to transport oxygen throughout the body.

23. What are the main respiratory organs in human and in insects?

In human – A pair of lungs.

In insects – Spiracles and Tracheae.

24. Write the respiratory organs in frog and earthworm.

Frog : A pair of lungs and skin

Earthworm: Moist skin

25. How does fish breathe under water?

The fish breathe with the help of gills under water.

26. Name the tiny pores in the leaves through which exchange of gases takes place.

Stomata.

27. What are anaerobes?

The organisms that can survive in the absence of air are called anaerobes.

28. Name two anaerobes.

i. Yeast ii. Anaerobic Bacteria

29. What are the uses of yeasts?

Yeasts are used to make wine and beer.

30. Name a part of human body which respire anaerobically sometimes.

Muscules.

31. When you are cycling or walking fast, then you require more energy. How does this energy requirement is fulfilled?

The anaerobic respiration takes place in the muscle cells to fulfil the energy requirement.

32. Write harmful effect of smoking.

Smoking damage lungs and also causes cancer.

33. What is the percentage of oxygen in inhaled and exhaled air.

Inhaled air - 21% oxygen

Exhaled air - 16.4% oxygen

II. Very Short Answer Type Questions.

1. What is the main role of blood in respiration?

the blood helps to transport oxygen throughout the body.

2. What is the source of this energy?

Food is the source of this energy.

3. How does this energy is released from the food.

This energy is released during respiration.

4. Why do all living organisms respire?

All living organisms respire to get energy from the food.

5. Name the breathing organs of cockroach and earthworm? [KV 2014]

Breathing organ of cockroach : Tiny openings called spiracles.

Breathing organ of earthworm : Moist skin.

III. Very Short Answer Type Questions.

1. What is tidal volume?

Tidal volume is the amount of air inhaled and exhaled in a single stroke.

2. What is the difference between cellular respiration and internal respiration?

Both cellular and internal respirations are the same processes.

3. How does exchange of gases take place in the plants?

Exchange of gases in plants takes place through the pores in the leaves called stomata.

4. Write the path of the air from the nasal cavity to the lungs.

Nasal cavity → Trachea or wind pipe → Bronchi → Bronchioles → Alveoli

I. Short Answer Type Questions.

1. Which gas present in air is essential for aerobic respiration? What is the role of oxygen during respiration? [NCERT Exemplar]

Oxygen present in air is responsible for respiration. The oxygen breaks down food and releases energy.

2. On an average, an adult human being at rest breathes 15-18 times per minute. The breathing rate, however rate, however, may differ under different condition. Arrange the following activities given in the box in order of increasing breathing rates and give reason for your answer.

Sleeping, cycling, brisk walk, watching T.V.

Sleeping > watching T.V > brisk walk > cycling.

Whenever a person does an activity, the breathing rate becomes faster. It further increases with strenuous work to provide more oxygen to the cells to get more energy.

3. On a very cold morning, boojho and Paheli were talking with each other as they walked down to their school. They observed that the air coming out of their mouth looked like smoke. They were amused and wondered how it happened. Help them find the answer.

On a cold day, the warm and moist air exhaled by us condenses into mist when in comes in contact with the cold air of the atmosphere. This looks like white smoke.

4. Whenever we feel drowsy or sleepy we start yawning. Does yawning help us in anyway? [NCERT Exemplar]

During drowsiness, our breathing rate slows down. The lungs do not get enough oxygen from the air resulting in yawning. Yawning brings extra oxygen into the lungs and helps us to keep awake.

5. Insects and leaves of a plant have pores through which they exchange gases with the atmosphere. Can you write two points of differences between these pores with respect to their position, number and extension into the body?

a. Spiracles are present on the sides of insects' body while stomata are present on the lower surface of leaves.

b. Spiracles are fewer in number as compared to stomata.

c. Spiracles lead to an extensive network of tracheal system which is absent in the leaves.

6. Explain the role of the diaphragm in the process of breathing.

When diaphragm contracts and moves downwards, the chest cavity enlarges and the pressure in lungs decreases. The air is breathed in to equalise pressure. When diaphragm relaxes and moves upwards, the lungs push out the air.

7. Write the difference in the composition of inhaled and exhaled air.

The inhaled air has larger concentration of oxygen and lesser concentration of carbon dioxide, whereas exhaled air has larger concentration of carbon dioxide and lesser amount of oxygen.

8. What happens to the air we breathe in, once it reaches the lungs?

When the air breathed in reaches the lungs it enters the alveoli. The alveoli are lined with blood capillaries and exchanges of gases occurs. The oxygen from the alveoli is taken up by the capillaries and carbon dioxide from the blood is transferred to alveoli.

9. How do frogs breathe on land and in water?

In water, frogs exchange gases through its thing, moist and smooth skin which is richly supplied with blood capillaries. On land, frogs breathe through lungs.

10. Explain the process of breathing in fish.

Fish gulps water through mouth and forces it between the gills. The oxygen in gets diffused into the blood circulating in gills and carbon dioxide in the bloodstream diffuses into the water which is carried out through a gap between fish's body and the gill cover.

11. Why should you breathe through your nose and not your mouth?

When we breathe through the nose, the dust particles, smoke, etc. get stuck in the hair present in the nose, which act as filters. But if we breathe through the mouth, all the dust will enter our body system.

12. What facilitates opening and closing of stomatal pores?

The stomatal pores are enclosed by two guard cells, which are surrounded by several subsidiary cells. All these three, namely stomatal pores, guard cells and subsidiary cells together constitute stomatal apparatus. The flow of the water into and out of guard cells facilitates closing opening of stomatal pores. This results in the exchange of gases.

13. Explain respiration in plants.

In plants, air from the atmosphere is taken in through stomata. The carbon dioxide in the air is utilised in the process of photosynthesis by the chloroplasts and oxygen is released out through stomata.

II. Short Answer Type Questions.

1. Explain aerobic respiration.

The process of cellular respiration which takes place in presence of oxygen is called aerobic respiration. In this process breakdown of glucose (food) takes place by combining with oxygen into carbon dioxide and water.

Glucose $\xrightarrow{with\ the\ use\ of\ oxygen}$ $Carbon\ dioxide + Water + Energy$

2. What do you mean by anaerobic respiration?

The process of respiration which takes place in the absence of oxygen is called anaerobic respiration. In this process, glucose (food) is broken down into alcohol or lactic acid, carbon dioxide and energy. The organisms that can survive in the absence of air are called anaerobes like yeast.

3. Explain anaerobic respiration in yeast and in our muscles.

In Yeast : Yeast gets energy through anaerobic respiration. In the absence of oxygen, glucose breaks down into alcohol and carbon dioxide.

Glucose $\xrightarrow{without\ the\ use\ of\ oxygen}$ $Alcohol + Carbon\ dioxide + Energy$

In Muscles : Our muscles can also respire anaerobically, but only for a short time. During heavy exercise, anaerobic respiration takes place in which glucose is broken into lactic acid and energy.

Glucose (In muscles) $\xrightarrow{In\ absence\ of\ oxygen}$ $Lactic + acid + Energy$

4. Explain two steps of breathing.

The two steps of breathing are as follows:

i. Inhalation: The taking in of air rich in oxygen into the body is called inhalation.

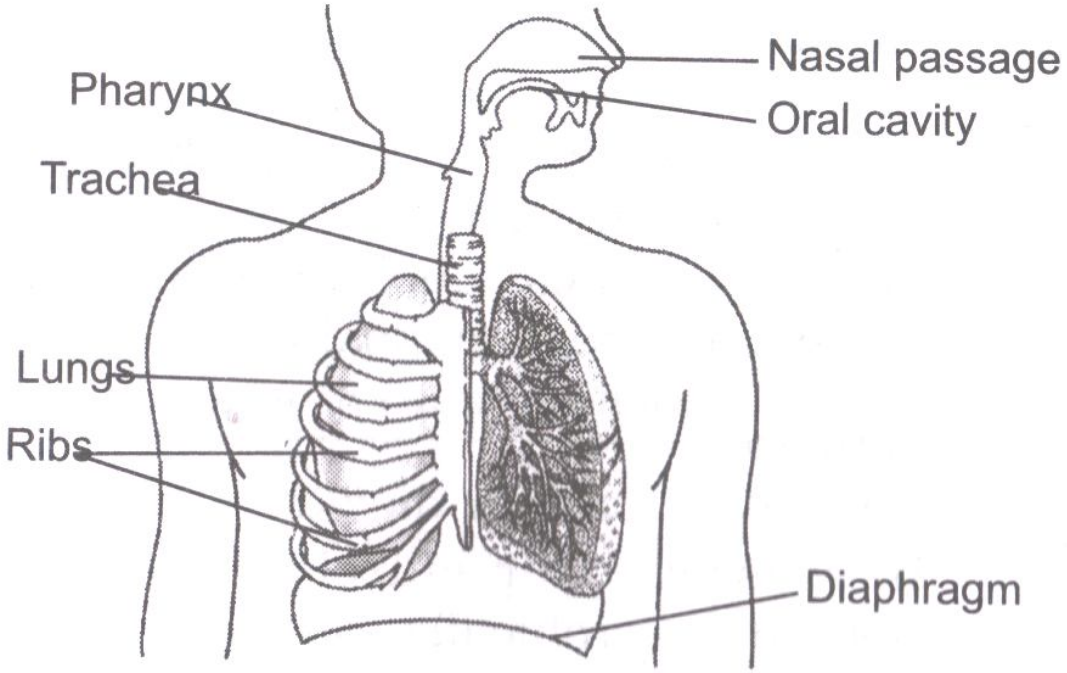
ii. Exhalation: The giving out of air rich in carbon dioxide is called exhalation. Breathing is a continuous process that takes place throughout the life.

5. What is the importance of breathing?

All the organisms need energy for their various functions. This energy is released from the breakdown of food (glucose) with the help of oxygen. The breathing ensures the continuous supply of oxygen to different body cells.

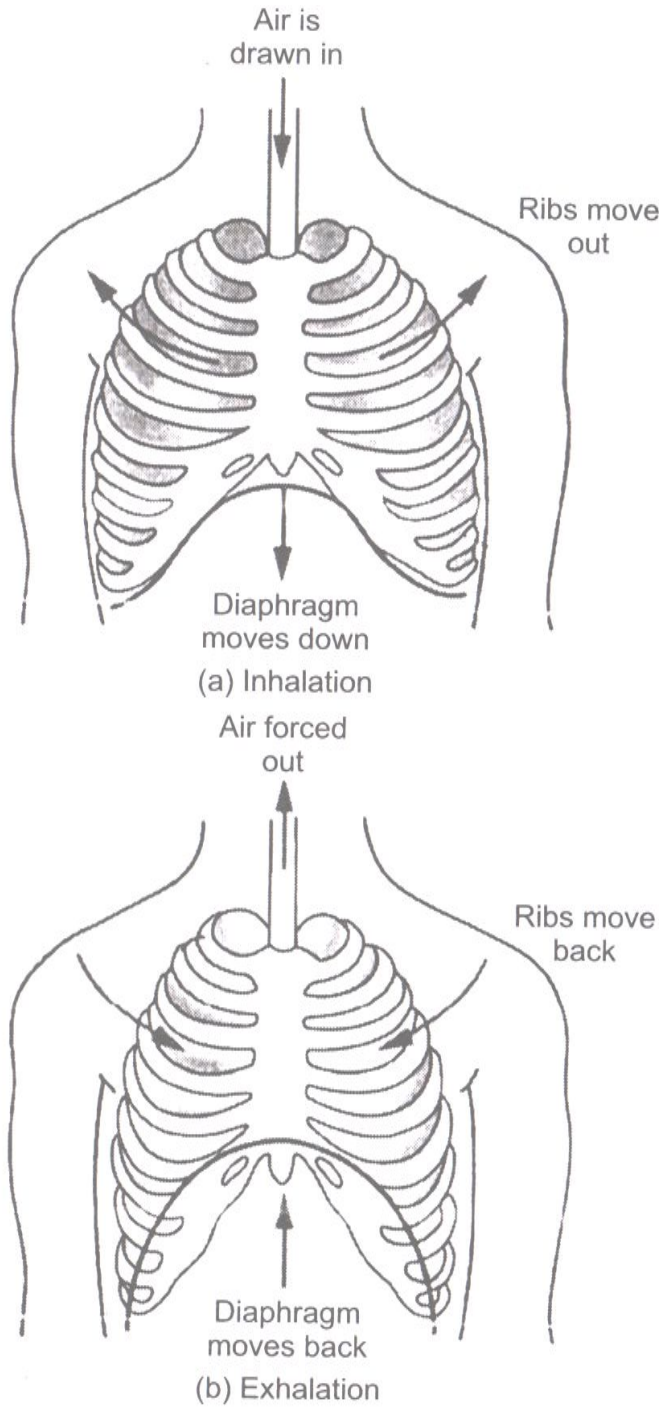
6. Explain the respiratory system in humans.

We take in air through our nostrills. When we inhale air, it passes through our nostrils into the nasal cavity. From nasal cavity, the air reaches our lungs through the windpipe. Lungs are present in the chest cavity. This cavity is surrounded by ribs on the sides. A large muscular sheet called diaphragm forms the floor of the chest cavity. Breathing involves the movement of the diaphragm and the rib cage.



7. Explain the mechanism of breathing in human beings.

The chest cavity is separated from the abdomen by a muscular wall called diaphragm. When diaphragm moves downwards and ribs move up and outward, the space in the chest cavity increases. As a result, air from atmosphere rushes through nose, trachea to lungs (inhalation or inspiration). When the diaphragm moves upwards to its original position, ribs move down and inward, the space in the chest cavity decreases. As a result, air from lungs is forced out of the body through air passage (exhalation or expiration).



8. Complete the following table: Table 10.1: Effect of breathing on the chest size of some classmates.

Name of the classmate	Size of the chest (cm)		
	During inhalation	During exhalation	Difference in size

Name of the classmate	Size of the chest (cm)		
	During inhalation	During exhalation	Difference in size
Rakesh	80 cm	75 cm	5 cm
Naresh	81 cm	75 cm	6 cm
Shyam	79 cm	74 cm	5 cm

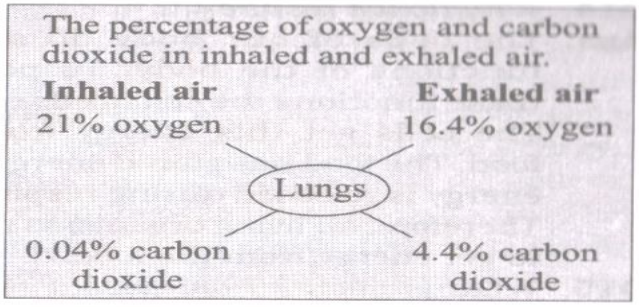
9. Why do you get muscle cramps after heavy exercise?

During heavy exercise more energy is required. But the supply of oxygen to provide energy is limited. The anaerobic respiration in muscle cells takes place to fulfil the demand of energy. The partial breakdown of glucose produces lactic acid. The accumulation of lactic acid causes muscle cramps.

10. Why do you feel hungry after a physical activity?

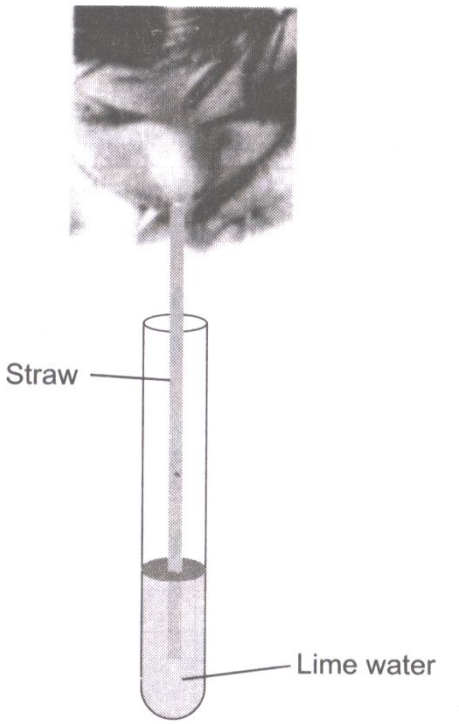
During physical activity we require more energy. To fulfil this energy requirement a person breathes faster. As a result more oxygen is supplied to our cells. Due to this rate of breakdown of food increases and more energy is released. Due to rapid breakdown of food we feel hungry.

11. What is the percentage of oxygen and carbon dioxide in inhaled and exhaled air?



12. Demonstrate that carbon dioxide is produced during respiration.

Take a clean test tube. Pour some freshly prepared lime water. Now blow gently through the straw for a few times. Lime water will turn milky. This is because of carbon dioxide present in the breathed air.



13. Do the plants also respire?

Yes, plants also respire like other organisms. They also take in oxygen from the air and give out carbon dioxide. In the cells oxygen is used to break down glucose into carbon dioxide and water.

$$\text{Glucose} \xrightarrow{\text{Oxygen}} \text{Carbon dioxide} + \text{Water}$$

14. Why do we respire?

The cells of our body do all the functions of the body. To perform these functions the cell needs energy. The cells get this energy from the food. The food has stored energy. This energy is released during respiration. Therefore, all living organisms respire to get energy from the food.

15. What is yeast? How does it respire?

Write its two uses

Yeast is a kind of fungus.it is a single cell organisms.

They respire anaerobically and during this process alcohol is produced.

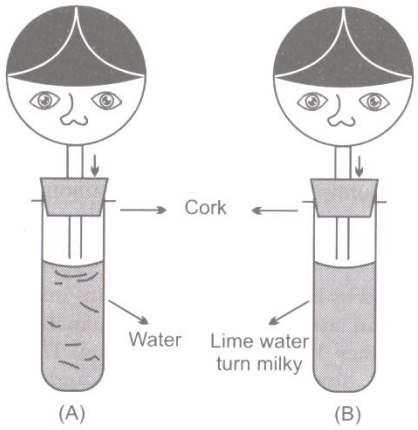
Uses of Yeasts:

i. Yeats are used to manufacture of alcohol

ii. They are used to make wine and beer.

III. Short Answer Type Questions-I

1. Observe given figure carefully and answer the following question.



(a) Which process is being tested in the activity ?

(b) What is the result of the activity ? Give reasons. [NCERT Exemplar]

(a) Exhalation process during respiration.

(b) The lime water in test-tube 'B' turns milky but water in tube 'A' remains unchanged. Because CO_2 is present in the exhaled air, it mixes with lime water in 'B' and turns it milky.

2. On a very cold morning, Boojho and Paheli were talking with each other as they walked down to their school. They observed that the air coming out of their mouth looked like smoke. They were amused and wondered how it happened. Help them find the answer.

[NCERT Exemplar]

On a cold day, the warm and moist air exhaled by us condenses into mist when it comes in contact with the cold air of the atmosphere. This looks like white smoke.

3. Pick the odd-one-out from each of the group given below on the basis of respiratory organs. Give reason for your answer.

(a) cockroach, grasshopper, snail, ant

(b) lizard, cow, earthworm, snake

(c) crocodile, whale, dolphin, fish

(d) snake, tadpole, crow, goat **[NCERT Exemplar]**

(a) Snail, as it does not breathe by means of trachea.

(b) Earthworm, because it breathes through its skin and it does not have lungs.

(c) Fish, as most fish breathe through their gills and do not have lungs.

(d) Tadpole, as it breathes through gills and does not have lungs.

4. Which gas present in air is essential for aerobic respiration ? What is the role of oxygen during respiration ? **[NCERT Exemplar]**

Oxygen present in air is responsible for respiration, the oxygen breaks down food and releases energy.

5. A food stall owner was preparing dough for making bhaturas. He added a pinch of yeast and sugar to the dough and left it in a warm place. After few hours, the dough had risen. There was a sour smell too.

(a) Why did the dough rise ?

(b) Why did the dough smell sour ?

(c) Why was sugar added to the dough ?

(d) What would have happened if the dough was kept in the refrigerator, soon after it was prepared? **[NCERT Exemplar]**

(a) The CO_2 released during respiration by the yeast results in the rise of dough.

(b) During anaerobic respiration, yeast produces alcohol resulting in sour smell.

(c) Sugar acts as food for yeast.

(d) At low temperatures, yeasts will not multiply and respire because of which the dough will not rise or become sour.

6. Observe the figures given as Figure (A) and (B) answer the following :

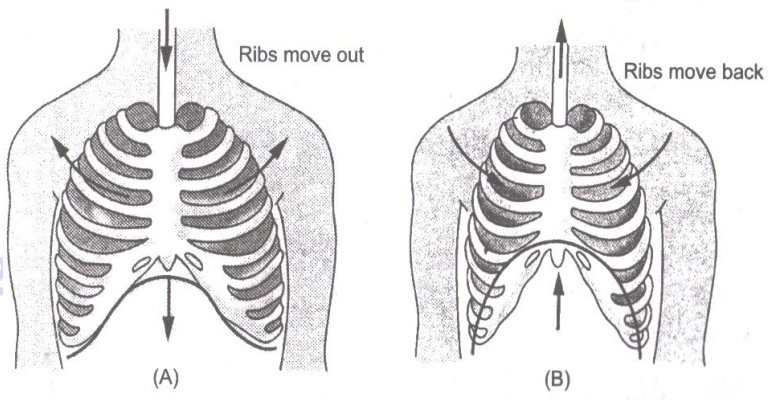
(a) Which of the figures A or B indicates the process of inhalation and which the process of exhalation?

(b) In the figure label the arrows and indicate the direction of

(i) movement of air

(ii) movement of diaphragm

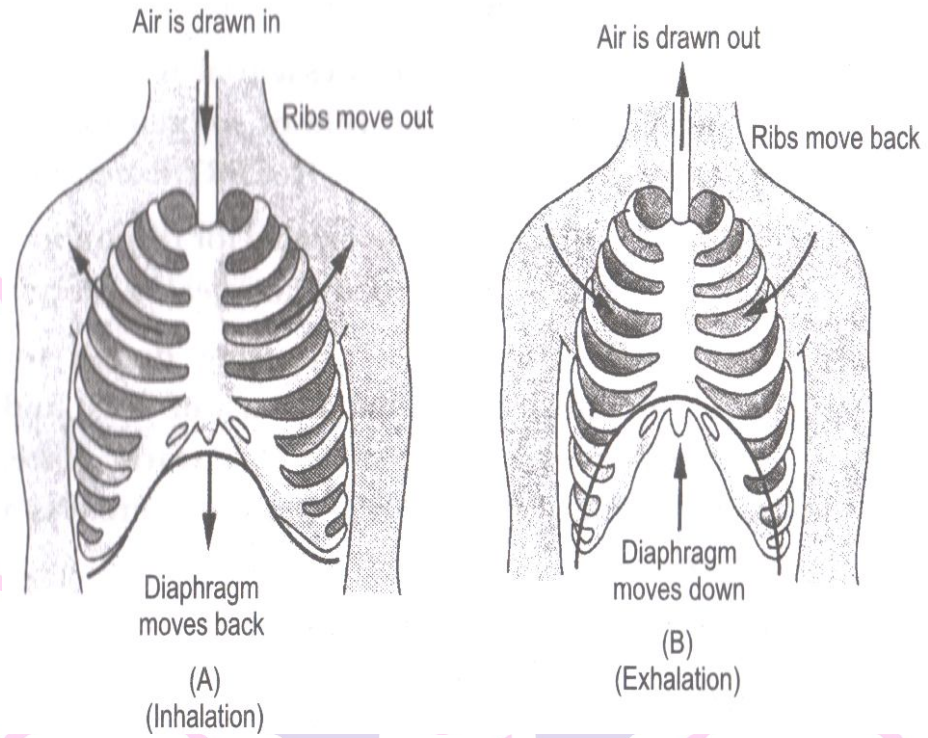
(iii) movement of ribs



[NCERT Exemplar]

(a) Fig. (A) indicates inhalation and Fig. (B) indicated exhalation.

(b)



III. Short Answer Type Questions- II

1. List the similarities and differences between aerobic and anaerobic respiration.

Differences between the aerobic and anaerobic respiration.

Aerobic Respiration	Anaerobic Respiration
1. It occurs in the presence of oxygen.	1. It occurs in the absence of oxygen.
2. Large amount ofenergy is released.	2. Small amount of energy is released.
3. Food molecules are water and carbon dioxide. Glucose $\xrightarrow{O_2}$ $CO_2 + H_2O$ + Energy	3. Food molecules are broken down into broken down into ethyl alcohol and carbon dioxide. Glucose $\xrightarrow{O_2}$ Alcohol + CO_2 + Energy

Similarities: Both aerobic and anaerobic respiration produce energy and gives out carbon

2. (a) How is aerobic respiration different from an anaerobic respiration.

(b) Complete the following reaction with the use of oxygen

i. Glucose $\xrightarrow{with\ teh\ use\ of\ Oxygen}$ _____ + _____ + Energy

ii. Glucose $\xrightarrow{with\ teh\ use\ of\ Oxygen}$ _____ + _____ + Energy

(a) See Q. N.1 (S.A.T-I I)

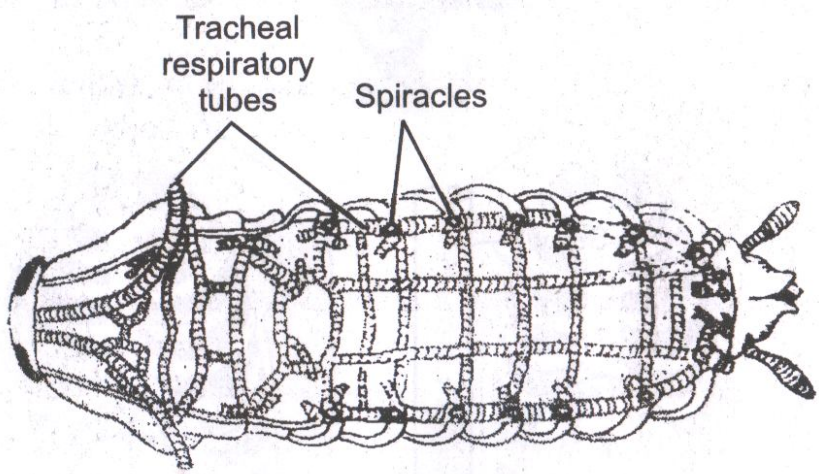
(b) (i) Carbon dioxide and water

(ii) Alcohol and Carbon dioxide

I. Long Answer Type Questions.

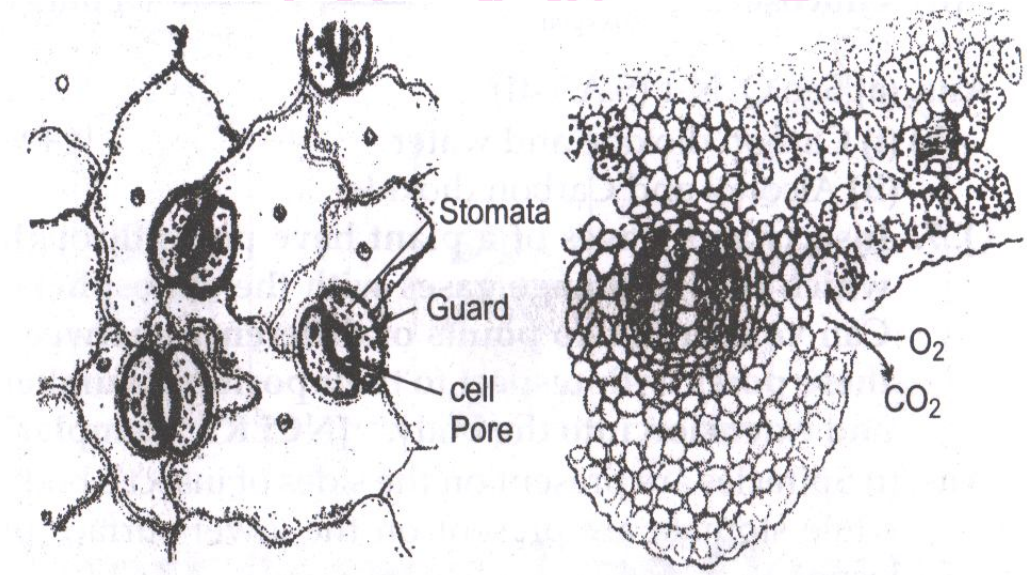
1. Explain the respirating system in cockroach.

A cockroach has small opening on the side of its body. These openings are called spiracles. Insects have a network or air tubes called tracheae for gas exchange, oxygen rich air rushes through spiracles into the tracheae for gas exchanges, oxygen rich air rushes through spiracles into the tracheal tubes, diffuses into the body tissues and reaches every cell of the body. Similarly carbon dioxide from the cells goes into the tracheal tubes and moves out through spiracles. These air tubes or tracheae are found only in insects.



2. Explain the respiration in plants.

Plants take in oxygen and give out carbon dioxide. In the cells, oxygen is used to breakdown glucose into carbon dioxide and water as in other organisms. In plants each part can independently take in oxygen from the air and give out carbon dioxide.



Leaves of the plants have tiny pores called stomata for exchange of oxygen and carbon dioxide. Like all other living cells of plants, the root cells also need oxygen to generate energy. Roots take up air from the air spaces present between the soil particles. The stem of some plants have tiny pores called lenticels which help in exchange of gases.

3. Write the differences between cellular respiration and breathing.

Difference between cellular respiration and breathing.

4. Write the difference between respiration and combustion.

Difference between respiration and combustion.

S.No	Respiration	Combustion
1	The energy released is stored in chemcial molecules	The energy released does not get stored.
2	No release of light and heat.	Heat and light released
3	Stepwise release of energy, no rise in temperature.	Fast reaction and sudden release of energy in one step. Rise in temperature takes place.
4	Happens at the body temperature.	Requires high ignition temperature (for burning fuel molecules)

5. Distinguish between photosynthesis and respiration.

Difference between photosynthesis and respiration.

S.No	photosynthesis	Respiration
1	Light energy is converted into chemical energy	Break down of food takes place with the released of energy.
2	Oxygen is given out	Carbon dioxide is given out.
3	Carbon dioxide is used is this process.	Oxygen is used, in the process.
4	Constructive process, sugar is synthesised.	Destructive process, sugar is broken down.
5	Takes place only in green plants.	Takes place in all animals and plants.

6. Paheli participated in a 400 m race competition held at here school and won the race. When she came home she had mixed feeling of joy and pain as she had cramps in her leg muscles. After a massage she was relieved of the pain. Answer the following questions related to the situation.

a. What can be the possible reasons for the pain in her legs?

b. Why did she feel comfortable after a massage?

[NCERT Exemplar]

a. The pain in her legs could be because of the accumulation of lactic acid in the muscles. During heavy exercise or running etc., the muscle cells respire anaerobically and produce lactic acid.

b. The massage gave her relief because it improves the circulation of blood leading to increased supplyof oxygen to the muscle cells which help in complete breakdown of lactic acid into CO_2 and water.

II. Long Answer Type Questions.

1. Write the differences between cellular respiration and breathing.

Cellular Respiration	Breathing
1. It is a biochemical process	1. It is a physical process
2. Breakdown of food takes place	2. Only inhalation and exhalation takes place
3. Energy is released	3. No energy is released
4. Carbon dioxide is produced	4. Carbon dioxide is given out of the body and oxygen is taken in from the air.
5. It is an intracellular process	5. It is an extracellular process

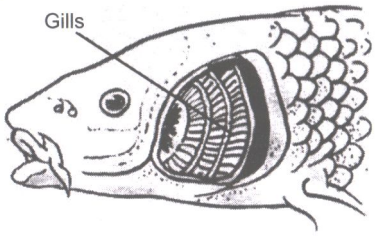
3. Write the differences between aerobic and anaerobic respiration.

Aerobic Respiration	Anaerobic Respiration
1. It takes place in presence of oxygen	1. It takes place in absence of oxygen
2. More energy is released	2. Less energy is released
3. CO_2 and water and energy are formed.	3. Lactic acid or alcohol in yeast. CO_2 and less energy formed.
4. Glucose $\xrightarrow{Oxygen}$ $CO_2 + H_2O + Energy$	4. Glucose $\xrightarrow{Without\ Oxygen}$ Alcohol + CO_2 + H_2O + Energy In Muscle cells Glucose $\xrightarrow{Without\ Oxygen}$ Lactic Acid + Energy

4. Explain the respiration of

i. Fish ii. Earthworms

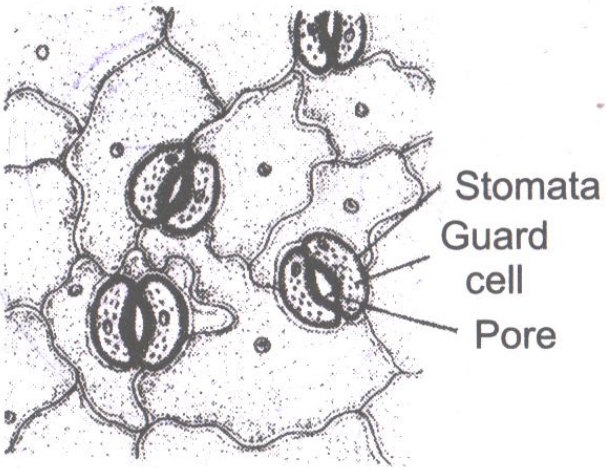
i. Respiration in fishes : Fishes live in water. They have gills which help in respiration. Gills separate oxygen from water. Gills are projections of skin.



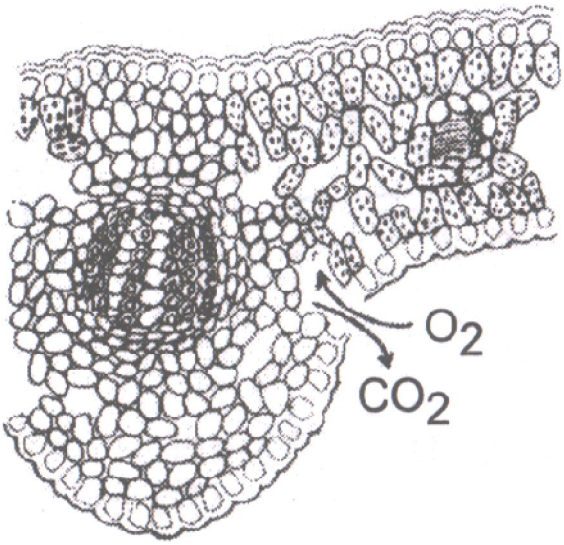
ii. Respiration in earthworm : The earthworms breathe through their skin. The skin of earthworm their skin. The skin of earthworm feels moist and slimy on touching. Gases can easily pass through them.

5. Explain the mechanism of respiration in plants.

plants take in oxygen and give out carbon dioxide during respiration. In the cells, oxygen is used to breakdown glucose into carbon dioxide and water as in other organisms. In plants each part can independently take in oxygen from the air and given out carbon dioxide.



(a)



(b)

Leaves of the plants have tiny pores called stomata for exchange of oxygen and carbon dioxide. Like all other living cells of plants, the root cells also need oxygen to generate energy. Roots take up air from the air spaces present between the soil particles. The stems of some plants have tiny pores called lenticels which help in exchange of gases.

III. Long Answer Type Questions.

1. Paheli participated in a 400 m race competition held at her school and won the race. When she came home she had mixed feelings of joy an pain as she had cramps in her leg muscles. After a massage she was relieved of the pain. Answer the following questions related to the situation.

a. What can be the possible reasons for the pain in the legs?

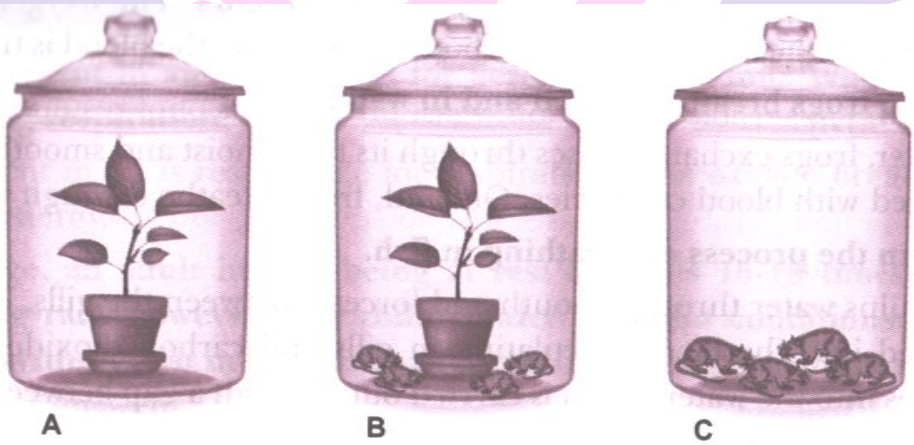
b. Why did she feel comfortable after a massage? **[NCERT Exemplar]**

a. The pain in her legs could be because of the accumulation of lactic acid in the muscles. During heavy exercise or running, etc., the muscle cells respire anaerobically and produce lactic acid.

b. The massage gave her relief because it improves the circulation of blood leading to increased supply of oxygen to the muscle cells which helps in complete breakdown of lactic acid into CO_2 and water.

2. Observe the figure given below carefully and answer the following questions.

[NCERT Exemplar]



a. In which jar, will the amount of CO_2 be the highest and why?

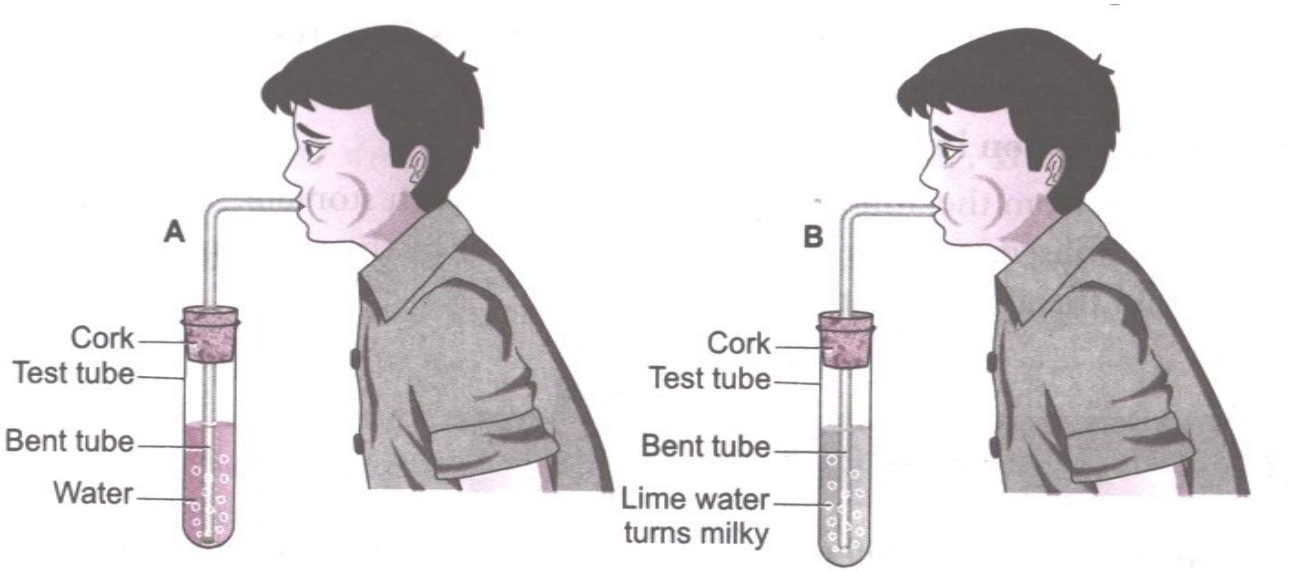
b. In which jar, will the amount of CO2 be the lowest and why?

a. 'C' The mice kept under the jar will breathe out CO_2continuously increasing in amount in the bell jar.

b. 'A' In jar 'A', the CO_2released during respiration is used by the plants during photosynthesis.

3. Observe the figure given below carefully and answer the following questions.

[NCERT Exemplar]



a. Which process is being tested in the activity?

b. What is the result of the activity? Give reasons.

a. Exhalation process during respiration.

b. The lime water in test tube 'B' turns milky but water in tube 'A' remains unchanged. Because CO_2 is present in the exhaled air, it mixes with lime water in 'B' and turns it milky.

4. A food stall owner was preparing dough for making bhaturas. He added a pinch of yeast and sugar to the dough and left it in a warm place. After few hours, the dough had risen. There was a sour smell too.

a. Why did the dough rise?

b. Why did the dough smell sour?

c. Why was sugar added to the dough?

d. What would have happened if the dough was kept in the refrigerator, soon after it was prepared? **[NCERT Exemplar]**

a. The CO_2 released during respiration by the yeast results in the rise of dough.

b. During anaerobic respiration, yeast produces alcohol resulting in sour smell.

c. Sugar acts as food for yeast.

d. At low temperatures, yeasts will not multiply and respire because of which the dough will note rise or become sour.

5. Observe the figures given as (A) and (B) and answer the following.

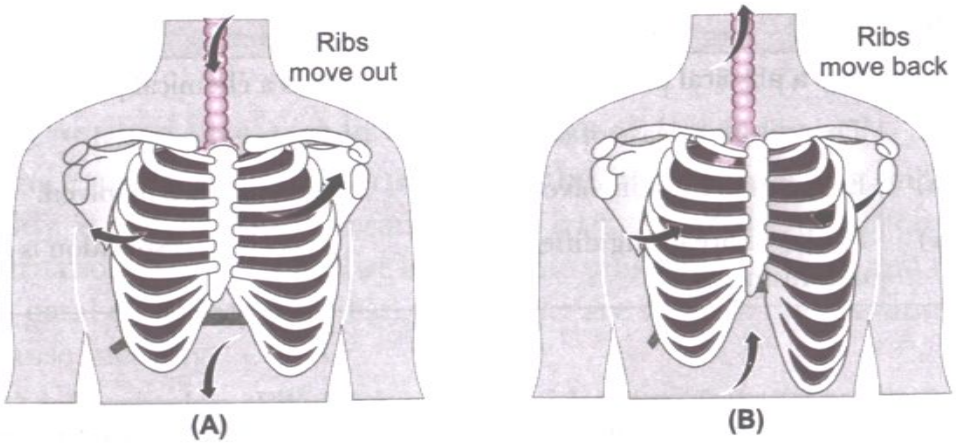
a. Which of the figures A or B indicates the process of inhalation and which the process of exhalation?

b. In the figure, label the arrows and indicate the direction of

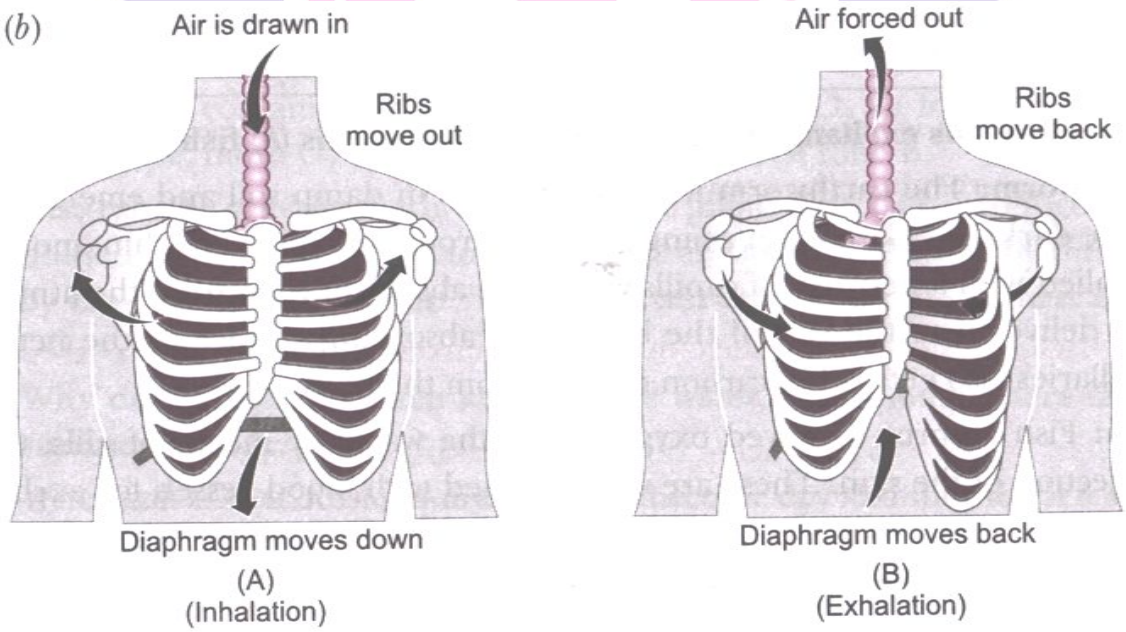
i. Movement of air.

ii. Movement of diaphragm.

iii. Movement of ribs. **[NCERT Exemplar]**



a. Figure (A) indicates inhalation, and figure (B) indicates exhalation.



6. List the similarities and differences between aerobic and anaerobic respiration. **[NCERT]**

Similarities:

In both aerobic and anaerobic respiration, the food is broken down to release energy.

Differences:

S.No	Aerobic respiration	Anaerobic respiration
i	Oxygen is required	Oxygen is not required
ii	Complete oxidation of food occurs	Oxidation of food is incomplete
iii	Carbon dioxide, water and energy are the end products.	Ethyl alcohol or lactate and carbon dioxide with little energy are the end products.

7. Distinguish between the following.

a. Breathing and Respiration

b. Respiration in plants and Respiration in animals.

a.

S.No	Breathing	Respiration
i	It is a physical process	It is a chemical process
ii	There is no release of energy	Energy is released
iii	Enzymes are not involved	Enzymes are involved
iv	Modes of breathing differ among organisms.	Process of respiration is same in all.

b.

S.No	Respiration in plants	Respiration in animals
i	Transport of air occurs through stomata	Transport of air occurs through nose.
ii	Carbon dioxide is absorbed and oxygen is released out	Oxygen is absorbed and carbon dioxide is released out.

8. How does gaseous exchange take place in (a) earthworms (b) fish?

a. Earthworm: The earthworm inhabits burrows in damp soil and emerges to feed in the darkness. Gaseous exchange occurs through its skin. The thin, moist skin is supplied with a network of capillaries which absorb oxygen from the atmosphere and deliver it to the rest of the body. The absorbing surface or the network of capillaries also gets rid of carbon dioxide from the body.

b. Fish: Fish absorbs dissolved oxygen from the water by means of gills. Gills are projection of the skin. These are well supplied with blood vessels for exchange of gases.

9. Explain the mechanisms of breathing in human beings.

In human beings, as in most vertebrates and mammals, gaseous exchange occurs in a pair of lungs. They are enclosed in an air-tight compartment called thorax (or chest). This region is bound by the ribs and the diaphragm. Several organs participate in the process of respiration in human beings. They are the nasal cavity, larynx, trachea, bronchi, alveoli and lungs. Air is inhaled or exhaled by the body as lungs are expanded or contracted by the simultaneous contraction and expansion of muscles attached to the ribs and diaphragm. The air containing oxygen is taken in through the nose where it is filtered and cleaned from dust particles, bacteria and other foreign substances by the mucus (stick liquid) and hair present in the nostrils. This air then passes through the larynx, the voice-box chamber situated in the neck region, to reach the tracheal tube or the windpipe. The trachea is a tube that runs from the larynx down the neck region into the thorax. From the thorax air reach the alveoli through bronchioles.

I. High Order Thinking Skills (HOTS) Question

1. Why does a fish did when kept outside water even through there is oxygen in the surrounding air?

Out of water the gills become dry and stick to each other. Thus gas exchange cannot occur.

II. High Order Thinking Skills (HOTS) Question

1. Why does an athlete breathe faster and deeper than usual after finishing the race? [NCERT]

While running an athlete needs to supply extra energy to his muscle cells for the extra work done. For this, he breathes faster and deeper so that more oxygen is supplied to the cells. This speeds up the breakdown of food and as a result, more energy is released.

2. Why do we often sneeze when we inhale a lot of dust-laden air? [NCERT]

Sneezing expels the foreign particles from the inhaled air, so that only clean air enters our body. It usually occurs because of the irritation in the upper breathing passage. This

irritation happens when we inhale some unwanted particles and they get trapped in our nasal cavity. Smoke, dust, pollen, etc. are some of the unwanted particles that may cause sneezing.

3. Take three test tubes. Fill ¼th of each with water. Label them A, B and C. Keep a snail in test tube A, a water plant in test tube B and C, keep snail and plant both. Which test tube would have the highest concentration of CO_2? [NCERT]

Test tube A will have the highest concentration of CO_2. This is because test tube A contains snail. Snail is an organism that breathes in O_2 and breathes out CO_2. Hence, CO_2 concentration increases in test tube A.

Test tube B contains a water plant, which take in CO_2 for food synthesis and gives out O_2. Hence, more O_2 concentration is found in test tube B.

Test tube C contains both a snail and a plant. The CO_2 produced by the snail is utilised by the plant for its food synthesis and the O_2 released by the plant is utilized by the snail for respiration. Therefore, test tube A has the highest concentration of CO_2.

4. Why does a fish die when kept outside water, even though there is oxygen in the surrounding air?

When fish is kept outside water, the gills become dry and stick to each other. Thus, gas exchange cannot occur.

Value Based Question

1. After coming from football match Ravi had cramping in his leg muscles. His father Mr.Sharma who is a physical trainer in his school advised him to take hot water bath.

On this situation answer the following questions.

i. Why do we get muscle cramps after heavy exercise?

ii. How far the advice given by Ravi's father is effective?

iii. Which value is shown by Mr.Sharma?

i. The cramps occur when muscle cells respire anaerobically. The partial break down of glucose produces lactic acid, accumulation of which cause muscle cramps.

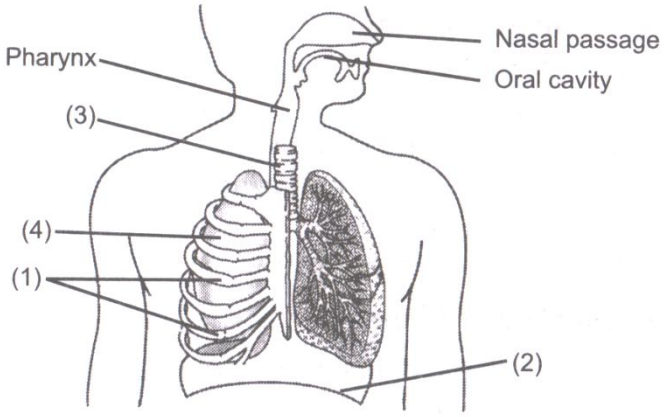
ii. How water bath improves circulation of blood. As a result, the supply of oxygen to the muscle cells increases and complete breakdown of lactic acid occurs to form carbon dioxide and water.

iii. Apart from his profession Mr.Sharma is caring and conscious about his son, so he gave the perfect advice to him to get relief from fatigue.

Skill Based Questions

1. i. Observe the following figure, what does it show?

ii. Label the missing parts marked as 1, 2, 3 and 4.



i. This figure show the human respiratory system.

ii. 1. Ribs 2. Diaphragm

3. Trachea 4. Lungs

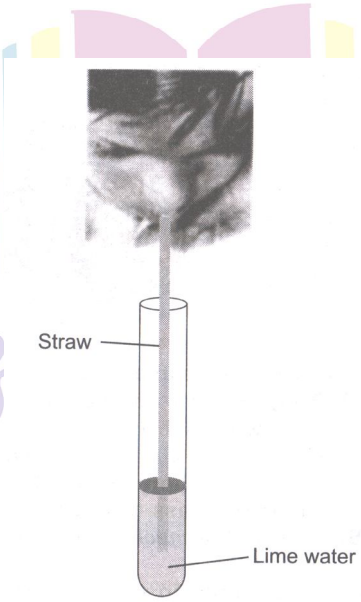
2. i. Draw a diagram to show the effect of exhaled air on lime water and label it.

ii. What is the effect of exhaled air on lime water?

iii. Why does the lime water become milky?

iv. What does this activity prove?

i.

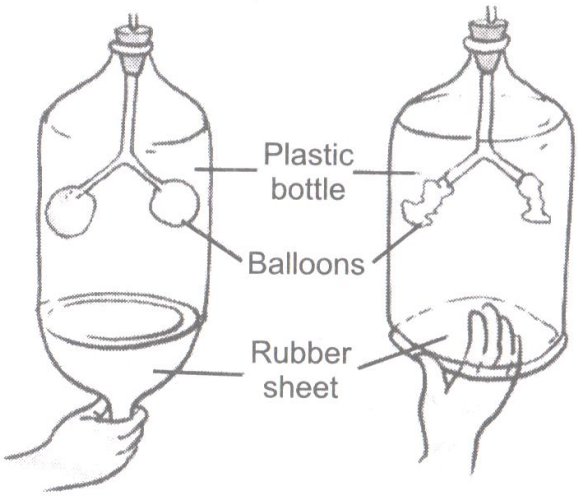


ii. The lime water becomes milky when exhaled air passes through it.

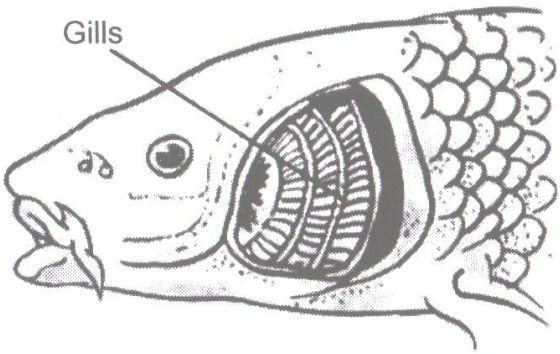
iii. Exhaled air contains more CO_2 which makes lime water milky.

iv. This activity shows that CO_2 gas is released in the cellular respiration.

2. Draw a labelled diagram to show the mechanism of breathing.

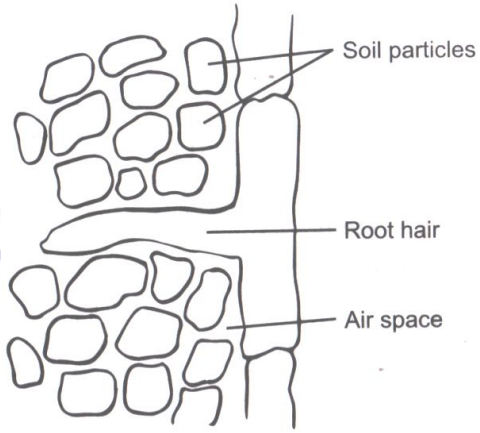


4. Draw a diagram of a part of fish and indicate the position of gills in a bony fish.



5. Draw a diagram in which roots absorbing air from the soil are indicated and label the following.

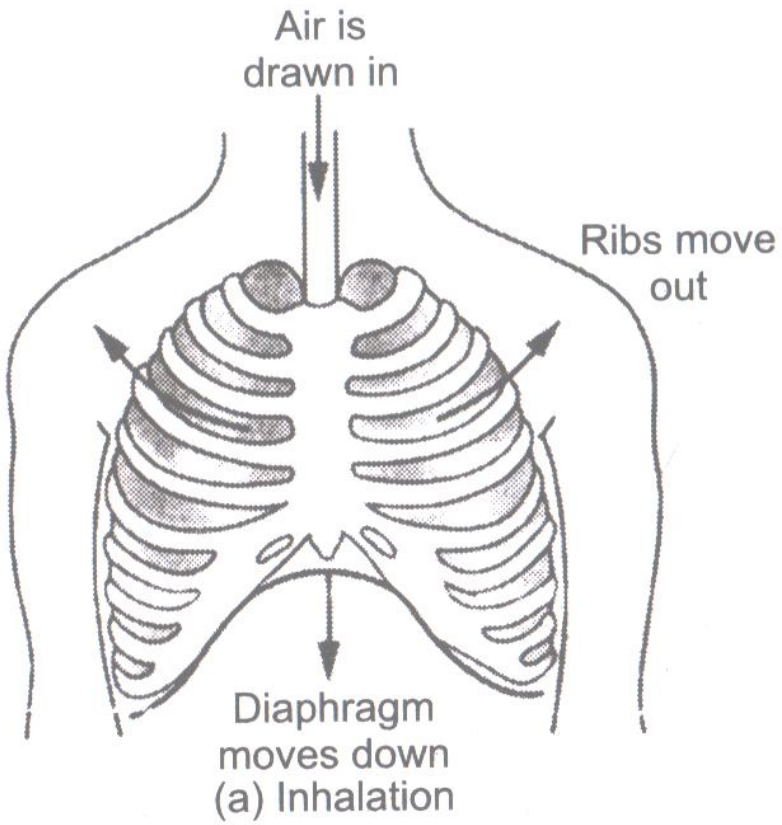
a. Root hair b. Air space c. Soil particles



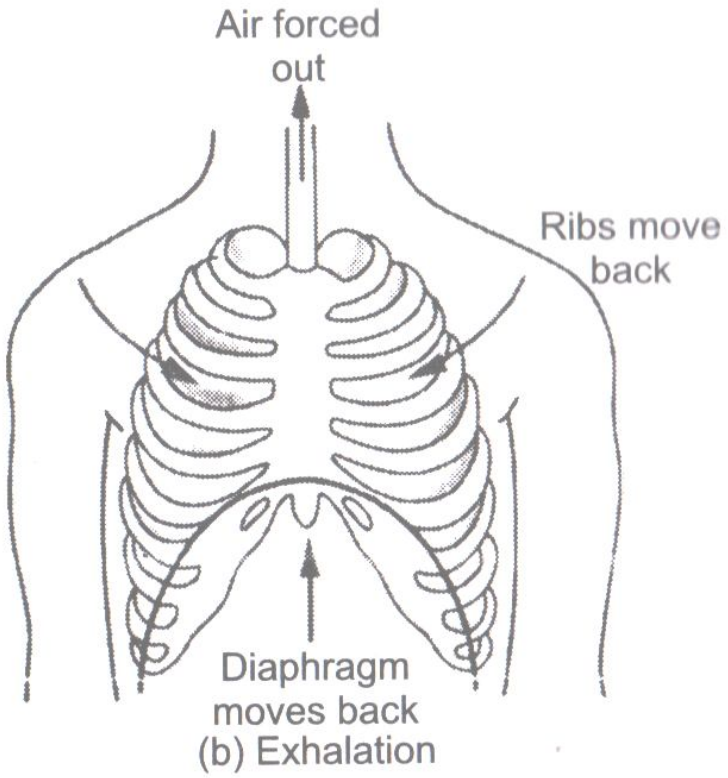
6. Draw a diagram to show the position of diaphragm at the time of

i. Inhalation **ii. Exhalation**

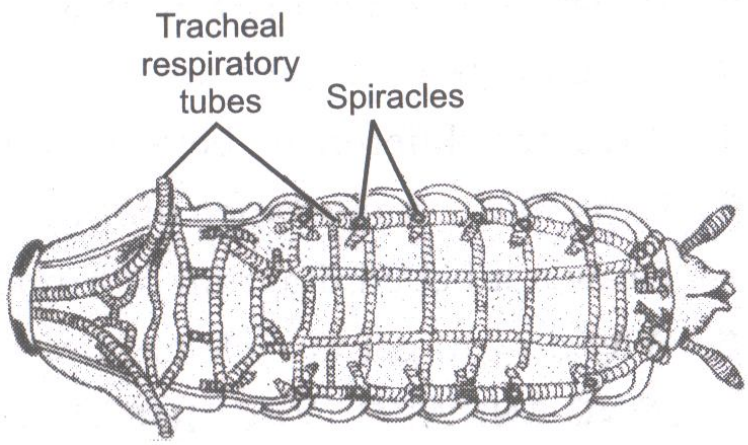
i.



ii.

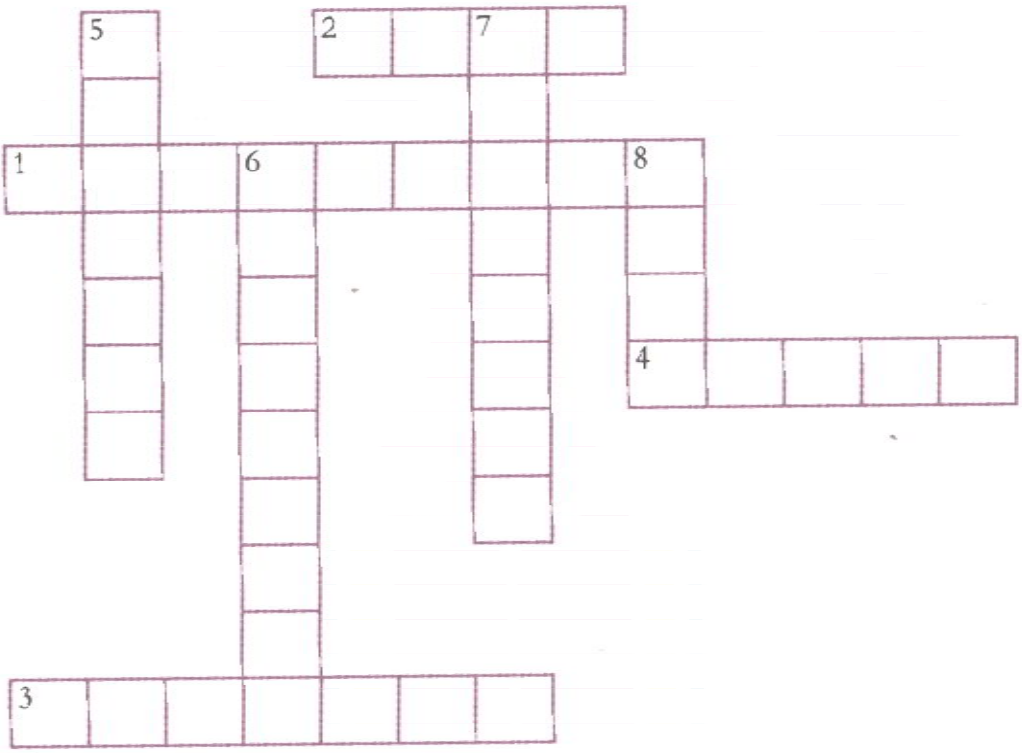


7. Draw a diagram of cockroach to show its Tracheal system.



Crossword Puzzle

1.



Across

1. A physical process that involves the taking in and giving out of air
2. Air enters the body in humans through this
3. Wind pipe in vertebrates.
4. Tow bag-like structures into which air enters in humans.

Down

5. Respiration that breaks down glucose with the use of oxygen

6. Respiration that breaks down glucose without using oxygen

7. Tiny holes present

8. Fish breathes through it

Across

1. breathing

2. nose

3. trachea

4. lungs

Down

5. aerobic

6. anaerobic

7. spiracle

8. gill